Component of Statistics Canada Catalogue no. 82-003-X
Health Reports

Article

The influence of childhood obesity on the development of self-esteem

by F. Wang, T.C. Wild, W. Kipp,
S. Kuhle and P.J. Veugelers

May, 2009

Statistics Canada Statistique Canada

Canada

The influence of childhood obesity on the development of self-esteem

by F. Wang, T.C. Wild, W. Kipp, S. Kuhle and P.J. Veugelers

Abstract

Background

The consequences of overweight in childhood for physical health have received considerable attention, but relatively little research has examined the mental health consequences. This article examines longitudinal relationships between body weight and self-esteem in a nationally representative probability sample of Canadian children.

Data and methods

The data are from cycles 1, 2 and 3 of the Canadian National Longitudinal Survey of Children and Youth. Logistic regression analysis using weighted data examined whether body weight at baseline predicted self-esteem two and four years later.

Results

When baseline self-esteem and other potential confounders were taken into account, children who were obese at baseline had almost twice the odds of reporting low self-esteem four years later, compared with children of normal body weight. Ancillary analyses indicated that baseline self-esteem was not associated with body weight status two or four years later.

Interpretation

The current childhood obesity epidemic may trigger an increase in the population prevalence of low self-esteem in the future. According to other research, low self-esteem predicts poor mental health. The curent childhood obesity epidemic may increase the prevalence of not only chronic diseases, but also poor mental health.

Keywords

body mass index, child development, exercise, health surveys, learning, mental health, prospective studies

Authors

F. Wang, T.C. Wild, W. Kipp, S. Kuhle and P.J. Veugelers (1-780-492-9095, paul.veugelers@ualberta.ca) are with School of Public Health, University of Alberta, 650 University Terrace, 8303 112 Street, Edmonton, AB, Canada T6G 2T4.

Childhood overweight has become pandemic, and prevalence rates continue to rise. While the consequences of overweight in childhood for physical health are well described,[1,2] relatively little research has examined the mental health consequences.[3-5]

Self-esteem is associated with children's social, emotional, behavioural and mental development.[6-10] Several previous studies have reported an inverse relationship between obesity and self-esteem in childhood,[4,11,12] but these studies were cross-sectional and could not establish whether obesity affects self-esteem or whether self-esteem affects obesity.

Longitudinal analyses are best suited to disentangle temporal relationships between excess weight and self-esteem, but only two such studies have been published and the findings were mixed.[13, 14] One reported that low self-esteem predicted subsequent excess weight among girls, but not among boys.[13] The other concluded that excess weight predicted subsequent low self-esteem, but not vice versa.[14]

This study further investigates longitudinal relationships between excess weight in childhood and low self-esteem, using a large, nationally representative sample of Canadian children. Because the direction of the relationship is not well established, two longitudinal models were examined—one in which childhood overweight precedes the development of low self-esteem (primary research question), and another in which low childhood self-esteem precedes the development of overweight (secondary research question).

Methods

Data source

The data are from Statistics Canada's National Longitudinal Survey of Children and Youth, a prospective cohort survey that describes the development, well-being and health of Canadian children and youth. The survey began in 1994/1995 (cycle 1) with the enrollment of 22,831 children aged 0 to 11 years. Every two years since then, participants have been re-interviewed.[15] Interviewers administer the survey in person to the child and to the person most knowledgeable about the child (mother: 91.3%; father: 8.2%; non-parent: 0.5%).[15]

The subgroup examined in the present study consists of 2,879 children who were aged 10 or 11 in cycle 1 (only respondents with complete self-esteem measures were included). Follow-up information was available in cycle 2 for 2,018 of these children when they were aged 12 or 13, and for 1,806 of them in cycle 3 when they were aged 14 or 15. Subsequent cycles did not provide comparable information on self-esteem.

Self-esteem assessment

Children completed a four-item scale that assessed their overall self-esteem: (1) "In general, I like the way I am"; (2) "Overall I have a lot to be proud of"; (3) "A lot of things about me are good"; and (4) "When I do something, I do it well." Response options for each item were: false, mostly false, sometimes false/sometimes true, mostly true, and true (scored 0, 1, 2, 3 and 4, respectively). Because internal consistency (Cronbach's α) for the composite four-item scale was adequate (0.73), scores were summed. Scores below the 15th percentile on the distribution of scale scores were considered to indicate low self-esteem (this cutoff is a commonly used approximation to the parametric concept of one standard deviation below the mean[14]). Higher scores were considered to indicate normal self-esteem.

Weight assessment

The person most knowledgeable about the child reported the child's height and weight, from which body mass index (kilograms divided by height in metres squared) was calculated. Cutoff points established for children by International Obesity Task Force were applied to determine overweight and obesity.[16] These cutoffs are based on definitions of adult overweight (body mass index greater than or equal to 25kg/m^2) and obesity (body mass index greater than or equal to 30 kg/m^2), adjusted to specific age and gender categories for children.[16]

Covariates

Adjustments were made to account for other variables known to influence the relationship between excess weight and self-esteem: sex of the child, the child's school performance, rural or urban residence, household income, parental education, and the child's physical activity and screen time.[12]

Sex of the child, the child's school performance, rural or urban residence, household income, and parental education were available from a questionnaire completed by the person most knowledgeable about the child. The person most knowledgeable was asked to assess the child's school performance based on their knowledge of his or her schoolwork and report cards: (1) very poor or poor; (2) average; and (3) good or very good. Household income was divided into four categories: lowest (less than $20,000 a year), lower-middle ($20,000 to $39,999), upper-middle ($40,000 to 59,999), and highest ($60,000 or more). Parental education was classified as: (1) less than secondary graduation; (2) secondary graduation; (3) some postsecondary; and 4) postsecondary graduation.

Children answered questions about how frequently they participated in physical activity and screen time. Two physical activity questions were asked: when not at school, whether he or she played any sports or did any physical activities (a) with or (b) without a coach or instructor in the last year. For this analysis, responses to both questions were combined to create four categories: 1) twice a week or less; 2) three or four times a week; 3) five to seven times a week; and 4) eight or more times a week. The two screen time questions, which asked how many times per week (not including school hours) the child (a) used a computer or played video games and (b) watched television, were collapsed into a single indicator.

Statistical analysis

Because body weight (overweight or obese versus normal weight) and self-esteem (low versus normal) were treated as categorical variables, univariate and multivariate logistic regression analyses were conducted. Cross-sectional data were used to determine concurrent relationships between body weight and self-esteem, based on data from cycle 1 only. To assure valid inferences to the reference population (children aged 10 or 11), these analyses were weighted with National Longitudinal Survey of Children and Youth cross-sectional sampling weights.

The primary research question, "Does excess weight predict low self-esteem at two- and four-year follow-up," was addressed with data on overweight and obesity and potentially confounding covariates obtained at baseline (cycle 1) and follow-up data on self-esteem collected two and four years later (cycles 2 and 3). These analyses were further adjusted for baseline self-esteem to capture the influence of body weight on changes in self-esteem between baseline (cycle 1) and follow-up (cycle 2 or 3).

The secondary research question, "Does self-esteem affect body weight at two- and four-year follow-up," was addressed with information about self-esteem and confounders at baseline (cycle 1) and data on body weight at follow-up (cycles 2 and 3). The analysis also adjusted for baseline (cycle 1) body weight status to capture the influence of self-esteem on changes in body weight between baseline (cycle 1) and follow-up (cycle 2 or 3).

To assure valid inference to the external population, all longitudinal analyses were weighted using relative longitudinal sampling weights. Sampling weights were prepared by Statistics Canada, and accounted for design effects due to complex sampling strategies and for non-response bias.[18] Statistics Canada also provided 1,000 bootstrap weights for parameter and variance estimation. Missing values were considered as separate covariate categories. All statistical analyses were performed using the STATA statistical software package, version 10.0.

Results

Low self-esteem related to weight

Descriptive characteristics of 10- and 11-year-old Canadian children in relation to self-esteem (low versus normal) are presented in Table 1. Low self-esteem at baseline was more prevalent among overweight and obese children than among their normal-weight contemporaries. Other correlates of low self-esteem were poor school performance, limited parental education, and infrequent physical activity.

Cross-sectional associations

The first two columns of Table 2 present the unadjusted and adjusted cross-sectional associations between body weight and the other variables. Relative to normal-weight children, those who were obese had almost twice the odds of reporting low self-esteem in 1994/1995. This association persisted in multivariate analysis that adjusted for the confounders (OR = 1.84; 95% CI: 1.01 to 3.47). School performance, parental education and physical activity level were also significantly associated with low self-esteem at baseline.

Temporal relationships

As expected, baseline self-esteem was significantly associated with self-esteem two and four years later (Table 2). Compared to children with normal self-esteem, those whose self-esteem was low at baseline had 3.55 times (95% CI: 2.40 to 5.23) and 3.29 times (95% CI: 2.16 to 5.01) the odds of reporting low self-esteem two and four years later, respectively. Even when baseline self-esteem scores and the other covariates were taken into account, baseline body weight was independently associated with self-esteem in subsequent years (Table 2). Specifically, children who met the criteria for obesity were significantly more likely than normal-weight children to report low self-esteem four years later (adjusted OR = 1.82; 95% CI: 1.01 to 3.78).

Table 1
Percentage distribution of baseline characteristics, household population aged 10 or 11, Canada excluding territories, 1994/1995

	Total	Low self-esteem	Normal self-esteem	p-value
	Percentage distribution			
Body weight				0.03
Normal weight	74.6	68.4	76.0	
Overweight	19.7	22.7	19.0	
Obesity	5.7	8.9	5.0	
Sex				0.68
Girl	49.7	50.9	49.4	
Boy	50.3	49.2	50.6	
School performance				< 0.01
Poor or very poor	3.5	5.8	2.9	
Average	23.0	29.4	21.5	
Good or very good	73.5	64.8	75.6	
Residence				0.84
Urban	80.7	80.3	80.7	
Rural	19.4	19.7	19.3	
Annual household income				0.87
Less than $ 20,000	6.1	5.9	6.2	
$ 20,000 to $39,999	19.3	21.2	18.9	
$ 40,000 to $59,999	31.2	31.5	31.2	
$60,000 or more	43.4	41.4	43.8	
Parental education				0.01
Less than secondary graduation	6.8	9.0	6.2	
Secondary graduation	12.4	9.9	13.4	
Some postsecondary	24.9	23.1	25.9	
Postsecondary graduation	56.0	58.0	54.5	
Weekly physical activity				0.03
Twice or less	33.8	39.6	32.4	
Three or four times	26.2	25.4	26.4	
Five to seven times	34.0	32.0	34.5	
Eight or more times	6.0	3.1	6.8	
Weekly screen time				0.85
Twice or less	4.5	3.6	4.7	
Three or four times	8.2	8.4	8.2	
Five to seven times	57.6	57.1	57.7	
Eight or more times	29.7	31.0	29.4	

Note: P-values were obtained with χ^2-tests.
Source: 1994/1995 National Longitudinal Survey of Children and Youth.

Physical activity and sex were also statistically significant predictors of low self-esteem. Children participating in physical activity five to seven times a week were less likely than those participating no more than twice a week to have low self-esteem four years later (OR=0.55; 95% CI: 0.34 to 0.89). As well, boys were less likely than girls to have low self-esteem four years from baseline (OR=0.37; 95% CI: 0.25 to 0.55).

A complementary multivariate analysis restricted to children with normal self-esteem at baseline showed that the odds of developing low self-esteem four years later were greater (OR=1.36; 95% CI: 0.74 to 2.48) for those who were obese than for those who were in the normal weight range. The difference in this subgroup was not statistically significant.

Ancillary analyses conducted to assess whether self-esteem predicted excess body weight in subsequent years failed to demonstrate a statistically significant relationship. In a multivariate analysis that included all confounding variables in Table 1 and adjusted for baseline body weight, the

Table 2
Odds ratios relating selected characteristics to low self-esteem, household population aged 10 or 11 in 1994/1995, Canada excluding territories, 1994/1995, 1996/1997 and 1998/1999

	Cross-sectional analysis						Two-year follow-up (1996/1997)						Four-year follow-up (1998/1999)					
		95% confidence interval			95% confidence interval			95% confidence interval			95% confidence interval			95% confidence interval			95% confidence interval	
Characteristics in 1994/1995	Odds ratio	from	to	Adjusted odds ratio	from	to	Odds ratio	from	to	Adjusted odds ratio	from	to	Odds ratio	from	to	Adjusted odds ratio	from	to
Self-esteem																		
Normal†	...	...	...	...	...	...	1.00	...	...	1.00	...	...	1.00	...	...	1.00	...	...
Low	...	...	...	...	...	...	3.55*	2.40	5.23	3.40*	2.24	5.17	3.29*	2.16	5.01	3.19*	1.97	5.12
Body weight																		
Normal†	1.00	...	...	1.00	...	...	1.00	...	...	1.00	...	...	1.00	...	...	1.00	...	...
Overweight	1.33	0.92	1.93	1.29	0.86	1.94	1.38	0.93	2.06	1.36	0.87	2.14	1.12	0.74	1.69	1.03	0.64	1.66
Obesity	1.96*	1.09	3.62	1.84*	1.01	3.47	1.47	0.78	2.75	1.15	0.59	2.26	2.18*	1.08	4.39	1.82*	1.01	3.78
Sex																		
Girl†	1.00	...	...	1.00	...	...	1.00	...	...	1.00	...	...	1.00	...	...	1.00	...	...
Boy	0.94	0.71	1.26	0.94	0.68	1.29	0.52*	0.38	0.71	0.48*	0.33	0.69	0.39*	0.28	0.54	0.37*	0.25	0.55
School performance																		
Poor or very poor†	1.00	...	...	1.00	...	...	1.00	...	...	1.00	...	...	1.00	...	...	1.00	...	...
Average	0.69	0.34	1.40	0.68	0.33	1.42	0.72	0.30	1.73	0.81	0.33	2.00	1.76	0.61	5.13	1.45	0.50	4.18
Good or very good	0.43*	0.22	0.84	0.43*	0.21	0.86	0.41*	0.18	0.97	0.47	0.19	1.13	1.43	0.52	3.91	1.20	0.44	3.27
Residence																		
Rural†	1.00	...	...	1.00	...	...	1.00	...	...	1.00	...	...	1.00	...	...	1.00	...	...
Urban	1.03	0.79	1.34	1.04	0.78	1.39	1.11	0.83	1.49	1.08	0.79	1.50	1.30	0.93	1.82	1.18	0.81	1.73
Annual household income																		
Less than $20,000†	1.00	...	...	1.00	...	...	1.00	...	...	1.00	...	...	1.00	...	...	1.00	...	...
$20,000 to $39,999	1.17	0.52	2.69	1.27	0.54	2.99	0.60	0.27	1.35	0.57	0.26	1.26	1.24	0.54	2.85	0.91	0.38	2.20
$40,000 to $59,999	1.06	0.46	2.44	1.09	0.46	2.59	0.81	0.36	1.83	0.80	0.36	1.76	1.30	0.57	2.95	0.96	0.41	2.27
$60,000 or more	0.99	0.44	2.20	1.02	0.44	2.39	0.53	0.24	1.17	0.54	0.24	1.21	0.85	0.38	1.88	0.65	0.28	1.52
Parental education																		
Less than secondary graduation†	1.00	...	...	1.00	...	...	1.00	...	...	1.00	...	...	1.00	...	...	1.00	...	...
Secondary graduation	0.41*	0.20	0.84	0.42*	0.19	0.93	0.68	0.36	1.32	0.81	0.42	1.57	0.86	0.39	1.88	0.90	0.42	1.92
Some postsecondary	0.54	0.28	1.02	0.58	0.29	1.16	0.67	0.36	1.24	0.82	0.45	1.51	0.95	0.47	1.91	1.16	0.57	2.39
Postsecondary graduation	0.79	0.45	1.42	0.93	0.48	1.80	0.82	0.46	1.46	1.01	0.55	1.85	1.04	0.55	1.97	1.24	0.63	2.42
Weekly physical activity																		
Twice or less†	1.00	...	...	1.00	...	...	1.00	...	...	1.00	...	...	1.00	...	...	1.00	...	...
Three or four times	0.79	0.54	1.15	0.83	0.56	1.23	0.66	0.42	1.04	0.74	0.46	1.21	0.71	0.45	1.12	0.77	0.47	1.26
Five to seven times	0.76	0.54	1.06	0.79	0.55	1.12	0.68*	0.48	0.98	0.79	0.53	1.19	0.50*	0.33	0.76	0.55*	0.34	0.89
Eight or more times	0.37*	0.19	0.72	0.37*	0.18	0.77	0.32*	0.15	0.69	0.50	0.22	1.10	0.45	0.20	1.00	0.62	0.24	1.59
Weekly screen time																		
Twice or less†	1.00	...	...	1.00	...	...	1.00	...	...	1.00	...	...	1.00	...	...	1.00	...	...
Three or four times	1.36	0.52	3.54	1.60	0.60	4.31	0.58	0.19	1.83	0.70	0.21	2.32	0.63	0.17	2.33	0.67	0.15	2.93
Five to seven times	1.31	0.58	2.99	1.33	0.56	3.16	1.20	0.45	3.19	1.23	0.44	3.42	1.50	0.49	4.58	1.65	0.47	5.87
Eight or more times	1.40	0.60	3.24	1.40	0.58	3.35	1.27	0.47	3.47	1.47	0.52	4.18	1.47	0.48	4.50	2.14	0.60	7.63

† reference category
* significantly different from reference category ($p < 0.05$)
... not applicable
Source: 1994/1995, 1996/1997, and 1998/1999 National Longitudinal Survey of Children and Youth.

odds of overweight or obesity four years later among children with normal self-esteem at baseline did not differ significantly from the odds for those with low self-esteem at baseline (OR=0.94; 95% CI: 0.40 to 2.22 and OR=0.77; 95% CI: 0.13 to 4.48, respectively).

Discussion

Research on the consequences of childhood obesity has focused primarily on physical health; few studies have examined mental health consequences.

What is already known on this subject?

- The prevalence of childhood obesity is increasing.
- Considerable research has examined the physical health consequences of childhood obesity.
- Low self-esteem in childhood predicts poor mental health in adulthood.
- Most studies of the mental health consequences of childhood obesity, and the few longitudinal studies that have been conducted, could not establish whether excess weight affects self-esteem or whether self-esteem influences excess weight.

What does this study add?

- Results from the National Longitudinal Survey of Children and Youth show that excess body weight predicted the development of low self-esteem among children over a four-year period.
- Low self-esteem did not predict excess weight.
- Regular physical activity was positively associated with self-esteem.

Because the findings of earlier studies have been mixed, the goal of this analysis was to examine longitudinal associations between body weight and self-esteem, based on a nationally representative sample of 10- and 11-year-olds.

The cross-sectional results of the present study were similar to those of other cross-sectional analyses, showing that body weight and self-esteem are inversely related among children.[4,11,12] As well, the longitudinal results are consistent with the view that excess body weight precedes the development of low self-esteem, rather than the reverse.[14] Specifically, even when the effects of a number of variables known to influence self-esteem were taken into account, childhood obesity predicted subsequent low self-esteem, but not vice versa.

These results are important in that other research has shown low self-esteem (negative self-regard[17]) to be associated with subsequent mental health problems such as anxiety, stress, loneliness, and greater likelihood of depression.[6-8] Low self-esteem may also lead to underachievement, increased vulnerability to drug and alcohol abuse,[18,19] and in some cases, self-destructive behavior.[7,10] These mental health issues may be underappreciated consequences of childhood obesity.

Why might obesity be related to the reduction self-esteem? Researchers have suggested that teasing from peers and social stigma could contribute to low self-esteem in obese children.[20-23] In fact, such circumstances may have mediated the longitudinal relationship between body weight and low self-esteem observed in this study, a possibility that might be examined in future research.

Beyond childhood obesity, the results are consistent with studies showing that regular physical activity is positively associated with self-esteem.[24] In particular, children participating in physical activity five to seven times a week reduced their odds of developing low self-esteem four years later by almost half. Thus, promotion of physical activity among all children, regardless of their weight, may enhance self-esteem. Tremblay and colleagues suggest that for some children, physical activity might be related to better academic performance by improving physical health and self-esteem.[25]

The results of studies of sex differences in self-esteem have not been consistent. While some have shown self-esteem tobe greater among girls than boys, most have indicated the opposite.[26-28] Others reported no significant gender difference in global self-esteem among children, and the self-esteem of girls to be at least as high as that of boys.[28,29] The present study found that, relative to girls, boys were significantly less likely to have low self-esteem at ages 10 and 11, and that this difference persisted longitudinally over the four-year follow-up period. Similar differences were reported in other research showing that girls generally assess their physical appearance and athletic competence more negatively than do boys.[30]

Like earlier research,[31,32] this analysis revealed a cross-sectional association between self-esteem and school performance. One mechanism that has been suggested to account for the relationship is that school performance may be enhanced by high self-esteem, since it may raise children's aspirations and foster confidence to deal with problems.[31] Alternatively, children and youth may develop confidence and self-esteem as they do well in school.[12,31,32] Although the current study reconfirms that poor school performance is significantly associated with low self-esteem, it did not predict low self-esteem two and four years later. These observations suggest that poor school performance affects the level of self-esteem but not changes in self-esteem over time. In earlier work we demonstrated that school performance predicts self-esteem, but not visa versa.[12]

Limitations

The strengths of the present study include a nationally representative sample of Canadian children and a longitudinal design that made it possible to investigate temporal relationships between body weight and self-esteem. The analyses adjusted for the influence of potential confounders. All analyses were weighted using population sampling weights and bootstrapping weights, which accounted for complex

survey design effects and non-response bias, and consequently, enabled the calculation of accurate estimates of standard errors.

Inferences drawn from this study should be tempered by awareness that the data are self-reported, and therefore, subject to error and recall bias.

Nutrition and dietary patterns could not be considered because they were not collected in the survey. Such information may be important for future research, given other findings showing that healthy eating is positively associated with school performance[32,33] and self-esteem among children.[12]

Body mass index cutoff points established for children by the International Obesity Task Force were applied to the survey data. These cutoffs do not allow the identification of those who were underweight. Caution is therefore warranted in extrapolating the findings to underweight children.

A final potential limitation is bias stemming from differential loss to follow-up. However, an attrition analysis did not show differential loss to follow-up according to self-esteem and body weight status: relative to children with normal self-esteem at baseline, those whose self-esteem was low had 1.04 times the odds of loss to follow-up at cycle 2; relative to children with normal weight at baseline, those who were overweight had 0.99 times the odds of loss to follow-up at cycle 3.

Conclusions

With data from the National Longitudinal Survey of Children and Youth, this study replicates and expands previous research showing that obese children are at increased risk of low self-esteem. The downstream consequences may be important, given that other studies have shown low self-esteem to be associated with poor mental health later in life. Interventions designed to promote active living and healthy eating may be beneficial for preventing obesity and improving self-esteem in the short-term, and for preventing chronic diseases and improving mental health in adulthood.

Acknowledgments

This research was funded through a Canada Research Chair in Population Health and Alberta Heritage Foundation for Medical Research Health Scholar Award to Dr. Paul J. Veugelers and through an Alberta Heritage Foundation for Medical Research traineeship award to Dr. Fangfang Wang.

References

1. Reilly JJ, Methven E, McDowell ZC, et al. Health consequences of obesity. *Archives of Disease in Childhood* 2003; 88: 748-52.
2. Must A, Anderson SE. Effects of obesity on morbidity in children and adolescents. *Nutrition in Clinical Care* 2003; 6(1): 4-12.
3. Flodmark CE. The happy obese child. *International Journal of Obesity (London)* 2005; 29 (Suppl. 2): 31-3.
4. French SA, Story M, Perry CL. Self-esteem and obesity in children and adolescents: a literature review. *Obesity Research* 1995; 3(5): 479-90.
5. Mendelson BK, White DR, Mendleson MJ. Children's global self-esteem predicted by body-esteem but not by weight. *Perceptual and Motor Skills* 1995; 80(1): 97-8.
6. Paradise AW, Kernis MH. Self-esteem and psychological well-being: implications of fragile self-esteem. *Journal of Social and Clinical Psychology* 2002; 21: 345-61.
7. McGee R, Williams S, Nada-Raja S. Low self-esteem and hopelessness in childhood and suicidal ideation in early adulthood. *Journal of Abnormal Child Psychology* 2001; 29(4): 281-91.
8. Palosaari U, Aro H, Laippala P. Parental divorce and depression in young adulthood: adolescents' closeness to parents and self-esteem as mediating factor. *Acta Psychiatrica Scandinavica* 1996; 93(1): 20-6.
9. Donnellan MB, Trzesniewski KH, Robins RW, et al. Low self-esteem is related to aggression, antisocial behavior, and delinquency. *Psychological Science* 2005; 16(4): 328-35.
10. Wild LG, Flisher AJ, Bhana A, Lombard C. Associations among adolescent risk behaviours and self-esteem in six domains. *Journal of Child Psychology and Psychiatry* 2004; 45(8): 1454-67.
11. Wardle J, Cooke L. The impact of obesity on psychological well-being. *Best Practice and Research Clinical Endocrinology and Metabolism* 2005; 19(3): 421-40.
12. Wang FF, Veugelers PJ. Self-esteem and cognitive development in the era of the childhood obesity epidemic. *Obesity Reviews* 2008; 9: 615-23.
13. French SA, Perry CL, Leon GR, Fulkerson JA. Self-esteem and change in body mass index over 3 years in a cohort of adolescents. *Obesity Research* 1996; 4(1): 27-33.
14. Hesketh K, Wake M, Waters E. Body mass index and parent-reported self-esteem in elementary school children: evidence for a causal relationship. *International Journal of Obesity and Related Metabolic Disorders* 2004; 28(10): 1233-7.
15. Statistics Canada. *National Longitudinal Survey of Children and Youth (NLSCY): Overview of Survey Instruments for 1994-1995 Data Collection Cycle* 1(Catalogue 89F007878XIE) Ottawa: Statistics Canada, 1995. Available at :http://www.statcan.ca/english/rdc/whatdata.htm. Accessed June 26, 2008.

16. Cole TJ, Bellizzi MC, Flegal KM, Dietz WH. Establishing a standard definition for child overweight and obesity worldwide: international survey. *British Medical Journal* 2000; 320: 1240-3.
17. The Counseling and Mental Health Center, the University of Texas at Austin. Available at: www.utexas.edu/student/cmhc/booklets/selfesteem/selfest.html Accessed February 6, 2008.
18. Gerrard M, Gibbons FX, Reis-Bergan M, Russell DW. Self-esteem, self-serving cognitions, and health risk behavior. *Journal of Personality* 2000; 68(6): 1177-201.
19. Wild LG, Flisher AJ, Bhana A, Lombard C. Substance abuse, suicidality, and self-esteem in South African adolescents. *Journal of Drug Education* 2004; 34(1): 1-17.
20. Musher-Eizenman DR, Holub SC, Miller AB, et al. Body size stigmatization in preschool children: the role of control attributions *Journal of Pediatric Psychology* 2004; 29(8): 613-20.
21. Robinson S. Victimization of obese adolescents *The Journal of School Nursing* 2006; 22(4): 201-6.
22. Cramer P, Steinwert T. Thin is good, fat is bad: How early does it begin? *Journal of Applied Developmental Psychology* 1998; 19(3): 429-51.
23. Strauss RS. Social marginalization of overweight children *Archives of Pediatrics and Adolescent Medicine* 2003; 157: 746-52.
24. Spence JC, McGannon K, Poon P. The effects of exercise and physical activity on self-concept and self-esteem: A meta-analysis. *Journal of Sport and Exercise Psychology* 2005; 27: 311-34.
25. Tremblay, MS, Inman JW, Willms JD. The relationship between physical activity, self-esteem and academic achievement in 12-year-old children. *Pediatric Exercise Science* 2000; 12: 312-23.
26. Kearney-Cooke A. Gender differences and self-esteem. *The Journal of Gender-Specific Medicine* 1999; 2(3): 46-52.
27. Jacobs JE, Lanza S, Osgood DW, et al. Changes in children's self-competence and values: gender and domain differences across grades one through twelve. *Child Development* 2002; 73(2): 509-27.
28. Sotelo MJ. Sex differences in self-concept in Spanish secondary school students. *Psychological Reports* 2000; 87(3 Pt. 1): 731-4.
29. Mullis AK, Mullis RL, Normandin D. Cross-sectional and longitudinal comparisons of adolescent self-esteem. *Adolescence* 1992; 27(105): 51-61.
30. Vasta R, Younger AJ, Adler SA, et al. *Child Psychology*. Toronto: John Wiley & Sons Canada, Ltd., 2009: 508-9.
31. Baumeister RF, Campbell JD, Kreuger JI, Vohs KD. Does high self-esteem cause better performance, interpersonal success, happiness or healthier lifestyles? *Psychological Science in the Public Interest* 2003; 4(1): 1-44.
32. Bowles T. Focusing on time orientation to explain adolescent self concept and academic achievement: Part I. Testing a model. *Journal of Applied Health Behaviour* 1999; 1(2): 1-8.
33. Taras H. Nutrition and student performance at school. *The Journal of School Health* 2005; 75(6): 199-214.
34. Florence M, Asbridge M, Veugelers PJ. Diet quality and academic performance in Nova Scotia Grade five students. *The Journal of School Health* 2008; 78: 209-15.